

What is Claimed is:

1. A method of fabricating a plurality of light emitting devices comprising:
 - 5 epitaxially forming a plurality of spaced apart mesa regions on a substrate, the mesa regions including therein a diode region;
 - defining first reduced area regions on the mesa regions;
 - forming a multilayer conductive stack that includes a barrier layer on the first reduced area regions of the mesa regions;
 - forming a passivation layer on the substrate between the mesa regions, on
10 exposed portions of the mesa regions and on exposed portions of the multilayer conductive stacks, the passivation layer defining second reduced area regions on the multilayer conductive stacks;
 - forming a bonding layer on the second reduced area regions of the multilayer conductive stacks; and
15 dicing the substrate between the mesas to produce the plurality of light emitting diodes.
2. A method according to Claim 1 wherein the dicing is followed by:
20 bonding the bonding layer to a submount.
3. A method according to Claim 2 wherein the bonding comprises thermocompression bonding the bonding layer to the submount.
4. A method according to Claim 2 wherein the bonding comprises solder
25 bonding the bonding layer to the submount.
5. A method according to Claim 4 wherein the passivation layer is non-wettable to solder that is used during the solder bonding the bonding layer to the submount.
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6. A method according to Claim 1 wherein the multilayer conductive stack includes a multilayer conductive stack sidewall, wherein the epitaxial region includes an epitaxial region sidewall and wherein the forming a passivation layer

comprises forming the passivation layer on the multilayer conductive stack sidewall and on the epitaxial region sidewall.

7. A method according to Claim 1 wherein the following is performed
5 between the forming a passivation layer and the forming a bonding layer:
forming an adhesion layer on the second reduced area regions of the
multilayer conductive stack.

8. A method according to Claim 1 wherein the following is performed
10 between the forming a passivation layer and the forming a bonding layer:
forming a solder wetting layer on the second reduced area regions of the
multilayer conductive stack.

9. A method according to Claim 1 wherein the following is performed
15 between the forming a passivation layer and the forming a bonding layer:
forming a shear strength enhancing layer on the second reduced area regions
of the multilayer conductive stack.

10. A method according to Claim 1 wherein the substrate includes a first
20 face adjacent the mesa regions and a second face opposite the mesa regions, and
wherein the dicing comprises dicing the substrate between the mesa regions to
produce the plurality of light emitting diodes including second faces of smaller
surface area than the first faces thereof.

25 11. A method according to Claim 1 wherein the substrate comprises silicon
carbide and wherein the epitaxial region comprises gallium nitride.

12. A method according to Claim 1 wherein the multilayer conductive
stack comprises an ohmic layer, a reflector layer and the barrier layer.

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13. A method according to Claim 1 wherein the ohmic layer comprises
platinum, palladium, nickel/gold, nickel oxide/gold, nickel oxide/platinum, titanium
and/or titanium/gold and wherein the reflector layer comprises aluminum and/or
silver.

14. A method according to Claim 1 wherein the barrier layer comprises tungsten, titanium/tungsten and/or titanium nitride/tungsten.

5 15. A method according to Claim 1 wherein the barrier layer comprises tungsten, titanium/tungsten and/or titanium nitride/tungsten.

16. A method according to Claim 12 wherein the barrier layer comprises a first layer comprising tungsten and a second layer comprising nickel.
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17. A method according to Claim 1 wherein the barrier layer comprises a first layer comprising tungsten and a second layer comprising nickel.

18. A method according to Claim 1 wherein the bonding comprises solder
15 bonding the bonding layer to the submount at less than about 210°C and wherein the barrier layer comprises a layer of titanium/tungsten that is between about 500Å thick and about 50,000Å thick.

19. A method according to Claim 1 wherein the bonding comprises solder
20 bonding the bonding layer to the submount at less than about 210°C and wherein the barrier layer comprises a first layer of titanium/tungsten that is about 5000Å thick and a second layer comprising nickel that is about 2000Å thick, on the first layer.

20. A method according to Claim 1 wherein the bonding comprises solder
25 bonding the bonding layer to the submount at more than about 250°C and wherein the barrier layer comprises a first layer of titanium/tungsten that is about 5000Å thick and a second layer comprising nickel that is about 2000Å thick, on the first layer.